Journal of International Information Management

Volume 10 | Issue 1 Article 1

2001

The roles of computer self-efficacy, outcome expectancy, and attribution theory in impacting computer system use

John W. Henry
Georgia Southern University

Robert W. Stone
University of Idaho

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ABSTRACT

The process by which individuals accept or reject information technologies was theoretically explained in a model employing attributional relationships and computer self-efficacy and outcome expectancy. The model was empirically tested using structural equations modeling and data collected in a field setting. The results provided partial confirmation of the theory that attributions to ability, effort, luck, and task difficulty impact information system use mediated by computer self-efficacy and outcome expectancy. The stable attributions of ability and task difficulty had meaningful impacts on computer self-efficacy. Similarly, task difficulty had a meaningful impact on outcome expectancy. The unstable attributes of effort and luck demonstrated meaningful impacts on computer self-efficacy but not outcome expectancy. In addition, these results showed that computer self-efficacy had a significant impact on both outcome expectancy and computer system use.

INTRODUCTION

Numerous factors that impact the success or failure of information technologies (IT) are well known. Examples include user involvement (Baroudi, Olson, & Ives, 1986; Boalnd, 1978; Debrabander & Edstrom, 1977; Mankin, Bikson, & Gutek, 1985; Trait & Vessey, 1988), senior management support (Leonard-Barton, 1988; Zmud, 1984), training (Glass & Knight, 1988), and realistic user expectations (Ginzbert, 1981; Salloway, Counte, & Kjerulff, 1987). Given that these factors have been identified and tested, there should be little resistance to the implementation and use of IT. However, problems with the acceptance and use of IT in the work place have been observed and documented (Argyris, 1971; Blackler & Brown, 1985; Cancro & Slotnick, 1970; Dowling, 1980; Meier, 1985; Rosen, Sears, & Weil, 1987; Henry & Stone, 1995). These documented studies provide fragmented evidence on the important antecedents of IT use and their dynamics impacting end-users' acceptance of IT in a volitional environment (i.e., when the user can decide whether or not to use IT in the performance of their job). In a nonvolitional setting (i.e., when the user must employ IT in the performance of their job), these dynamics address the degree that end-users employ a computer system. The purpose of this research is to address the need for such evidence by testing an attributional model of the dynamic process determining end-user volitional use of IT.

THE MODEL

A variety of research pieces have proposed attributional explanations of the behavioral dynamics when end-suers decide to use IT (Henry, Martinko, & Pierce, 1993; Martinko, Henry, & Zmud, 1996). These employ Weiner's (1979) work on achievement motivation as well as that of Abramson, Seligman, and Teasdale (1978) describing the role of attributions in Learned Helplessness (LH). While there are variations across these models and explanations, the basic core dynamics applied to IT system use are depicted in Figure 1. The model shows IT use as a function of end-user expectations. These expectations are formed from the end-users' attributions regarding the likely causes of their successes and failures when interacting with IT.

From the LH model (Abramson, Seligman, & Teasdale, 1978), there are predicted relationships for the use of IT. Those who accept and use IT are more likely to have had positive, prior and/or current experiences using IT. When forming expectations of the outcomes from interacting with IT, people actively using IT attribute prior successes with IT to be caused by internal and stable characteristics such as ability. Furthermore, they expect their outcomes from future IT use will be positive, In contrast, the individuals who are most likely to resist the use of IT to its full potential are more likely to have had negative prior experiences using IT. They also tend to attribute their likelihood of failed IT use to an internal and stable dimension such as lack of ability. They also expect for future outcomes from IT use to be negative. Thus, it appears plausible to expect that attributions will indirectly affect computer use as shown in the model in Figure 1.

The literature reports several studies testing parts of the above model. The purpose of this study is to unite these parts into a theoretically sound model for empirical testing. Specifically, the model links attributions regarding the success/failure of IT use to system use mediated by computer self-efficacy and outcome expectancy. The basis for this model can be found in the literature.

In a study of students enrolled in their first computer science course, Henry, Martinko, and Pierce (1993) found that students with optimistic attributional styles achieved higher grades then those with pessimistic attributional styles. Further, final grades were found to be related to causal attributions of ability. In a similar study of students enrolled in an introductory programming course, Henry, Stone, and Pierce (1993) found that students with positive expectations, operationalized as computer self-efficacy, were more likely to continue in the computer science or management information systems major than students with negative expectancies. The individuals with positive expectations also experienced less frustration while working on programming projects.

While these two studies provide support for the attributional model of reactions to IT, the support is limited. Both employed student samples and examined attributions and reactions in an educational setting rather than a work setting. In addition, the strength of these results was limited because of small sample sizes. For example, the sixty-nine subjects in the Henry et al. (1993) study reduced the probability of detecting significant relations. Thus, a more rigorous test of the attributional model in a field setting is needed.

Rather than developing an all-encompassing model of the antecedents to IT use, this research concentrates on two key relationships. These relationships are between attributions and expectancies and then between expectancies and computer system use. Previous attributional models predicting the use of IT (Martinko, Henry, & Zmud, 1996) as well as more general models of the attributional processes (Abramson et al., 1978; Seligman, 1990; Weiner, 1979 and 1985) depict a sequential chain of causal relationships. The causal relationships indicate that attributions cause expectancies and that expectancies cause the behaviors associated with computer system use. Thus, attributions influence system use, mediated by expectancies. Yet, attributions are viewed as the primary cause of these expectancies.

As Bandura (1977) and more recently Gist and Mitchell (1992) have shown, there are expectancies of two types: efficacy expectations and outcome expectations. Efficacy expectations are concerned with the individual's "... belief that one can successfully execute the behavior required to produce the outcomes" (Bandura, 1977, p. 193). That is the individual's belief that they are competent of performing a specific task (Bandura, 1977; Gist & Mitchell, 1992; Hirschheim & Newman, 1988, Weiner, 1985). Outcome expectations are defined as a "... person's estimate that a given behavior will lead to certain outcomes" (Bandura, 1977, p. 193). Outcome expectations are concerned with whether or not individuals believe that they will be rewarded if they achieve a desired level of performance.

Studies examining the relationships between attributions and specific expectations have been limited. The Weiner (1979) model of four primary attributions for performance was the basis of this research. These attributions are to ability, effort, luck, and task difficulty. In the model (shown in Figure 1), ability (stable and internal attribution) has a direct (i.e., positive) relationship with both self-efficacy and outcome expectancy. The impact of effort (an unstable and internal attribution) on these expectations varies depending on the degree of perceived success. For the empirical test conditions employed, these relationships are expected to be negative since the computer system studied has been in use for some time. Further, the attributions made by individuals were for their failed use with the system. These efforts would represent repeated failures over which the attributions were made. Luck (an unstable and external attribution) is expected to have no meaningful effect on the expectancies, while task difficulty (a stable and external attribution) is predicted to have an inverse impact. These relationships are detailed by several hypotheses described below. It is also the case that the hypotheses are based upon the end-

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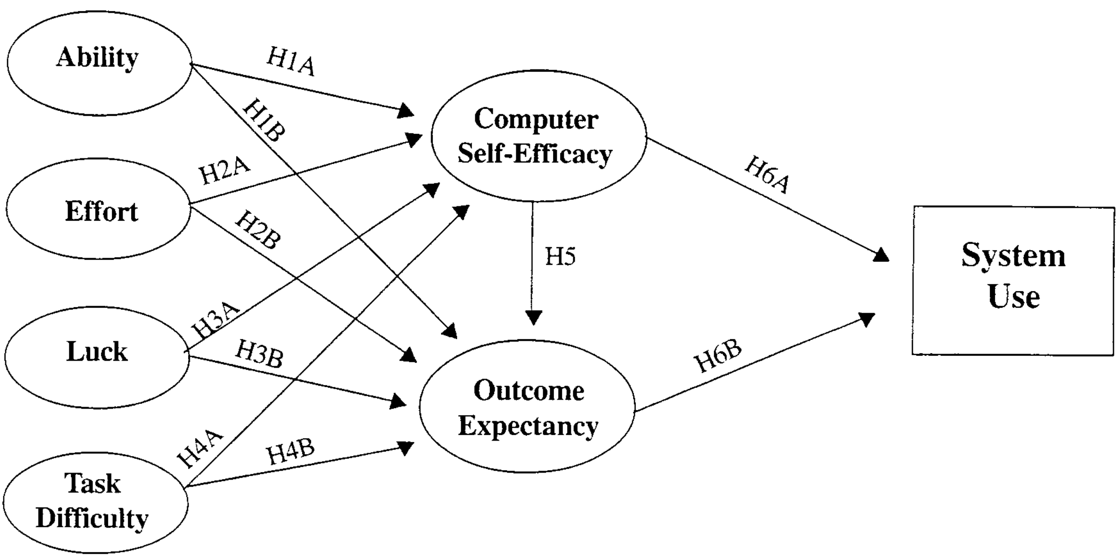
users' perceptions of how they made attributions when they were unsuccessful using the computer system. This is a common method of soliciting attributions.

THE HYPOTHESES

The model is summarized by a series of hypotheses described below. The hypotheses are also noted on the diagram of the model displayed in Figure 1.

Figure 1. The Model



Hypothesis 1A (H1A): Attributions to ability (stable/internal) have positive influences on computer self-efficacy.

Hypothesis 1B (H1B): Attributions to ability (stable/internal) have positive influences on outcome expectancy.

Hypothesis 2A (H2A): Attributions to effort (unstable/internal) have negative influences on computer self-efficacy.

Hypothesis 2B (H2B): Attributions to effort (unstable/internal) have negative influences on outcome expectancy.

Hypothesis 3A (H3A): Attributions to luck (unstable/external) have no meaningful influences on computer self-efficacy.

Hypothesis 3B (H3B): Attributions to luck (unstable/external) have no meaningful influences on outcome expectancy.

Hypothesis 4A (H4A): Attributions to task difficulty (stable/external) have negative influences on computer self-efficacy.

Hypothesis 4B (H4B): Attributions to task difficulty (stable/external) have negative influences on outcome expectancy.

Hypothesis 5 (H5): Computer self-efficacy has a positive influence on outcome expectancy.

Hypothesis 6A (H6A): Computer self-efficacy has a positive influence on system use.

Hypothesis 6B (H6B): Outcome expectancy has a positive influence on system use.

THE SAMPLE

In order to examine the proposed model, a questionnaire was developed for distribution in a large hospital in the southeastern United States. The questionnaire was developed with the help of several of the hospital administrators and gathered end-user perceptions and attitudes about the hospital's computer-based medical information system. The system is used in virtually all areas of the hospital to track patient procedures, direct tests to proper locations, maintain diagnosis and physician-specific order sets, provide adequate audit trails, and numerous other health care and related activities. The final form of the questionnaire was distributed to 1000 employees using the hospital's internal mailing system. A total of 383 usable responses were received, producing a 38.3% response rate. From the responses to several demographic variables included on the questionnaire, a profile of the respondents was developed. The statistics summarizing the responses to these demographic questions are displayed in Table 1.

The gender of the respondents was 9.1% male and 81.2% female, with 9.7% not answering this question. The average age of these respondents was 36.42 years with a minimum of 18 years and a maximum of 72 years. The median age was 35 years. The average years of employment at the hospital was 7.91 years, while the median was 5 years. The minimum years of employment at the hospital was less than one year with a maximum of 55 years. In terms of education obtained, the two most frequently cited categories were Some College or Technical Training Beyond High School (35.5%) and Graduated From College (36.8%). The remaining categories were Some High School (0.8%), Graduated From High School or G.E.D. (6.3%), Some Graduate School (7%), and Graduate Degree (6.5%). The other 7.1% of the respondents did not answer this question. The final demographic question related to the respondents did not answer this question. The final demographic question related to the respondent's position in the hospital. The most numerous positions among the respondents were Staff (32.9%) and RN or registered nurse (22.5%).

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Table 1. Sample Characteristics

RESPONSE RATE		
Total Questionnaires	Returns	Response Rate
1000	383	38.3%

GENDER		
Male	Female	No Response
9.1%	81.2%	9.7%

OTHER CHARACTERISTICS				
Variable	Mean	Median	Minimum	Maximum
Age	36.42	35.00	18	72
Employment Years	7.91	5.00	<1	55

EDUCATION

Education Level	Some High School	Graduated from High School or G.E.D.	Some College or Technical Training Beyond High School	Graduated From College	Some Graduate School	Graduate Degree	Did Not Respond
Percentage of the Staff	0.8	6.3	35.5	36.8	7	6.5	7.1

POSITION

Position	Director	Manager	Supervisor	Staff	RN	LPN	Secretary	No Response
Percentage	2.9	8.1	7.3	32.9	22.5	6.8	12.0	7.5

Other categories included Director (2.9%), Manager (8.1%), Supervisor (7.3%), LPN or licensed practical nurse (6.8%), and Secretary (12%). A total of 7.5% of the respondents did not report their position at the hospital. Based upon these demographics, there is a wide range of respondents in the sample. Therefore, response bias should not present a problem for the study.

THE MEASURES AND THEIR PSYCHOMETRIC PROPERTIES

The questionnaire items measuring the attributions were each prefaced by the statement "More than likely there have been times when you felt that you were NOT successful using (name of system). Please indicate to what extent you agree or disagree with the following statements for the cause of the problems you have using (name of system)." Such a method of eliciting causal attributions is typical in attribution research (Weiner, 1985). It has been shown that the validity of the responses is greater when asked about failure rather than success. The respondents were provided a 5 point Likert-type scale upon which to respond to each time. The scale and weights were: 5--strongly agree, 4--agree, 3--neutral, 2--disagree, and 1--strongly disagree. Using the same scale and weights, respondents were also asked to respond to questions measuring computer self-efficacy and outcome expectancy. The only other questionnaire item regarded the amount of time spent using the computer system. The respondents were asked to fill in a blank with this percentage. The individual questionnaire items and measures are shown in Table 2.

Table 2. The Questionnaire Items, Factor Loadings, Reliability Coefficients, and Shared Variances

Measures and Items	Factor Loading	Reliability Coefficient	% of Shared Variance
*Ability**		0.83	63%
1. I don't understand how the system works.	0.83		
2. Using the system does not come naturally to me.	0.79		
3. I don't have the ability to use the system.	0.75		
*Effort**		0.90	75%
4. I do not work as hard as I should to learn how to use the system.			
5. I do not spend as much time as I should to make sure that I use the system correctly.	0.84		
6. I spend little time at work learning to use the system.	0.91		
*Luck**		0.91	84%
7. I am unfortunate and "do the worng thing" without knowing what I am doing.	0.93		
8. I am unlucky and often make mistakes using the sytem.	0.90		
*Task Difficulty**		0.89	68%
9. Most of the tasks I perform with the system are complex.	0.82		
10. The system works in such a way that mistakes are easy to make.	0.75		
11. Orders and entries are difficult to make using the system.	0.80		
12. The system is difficult to use.	0.92		
Computer Self-Efficacy		0.71	55%
13. I am able to use all the functions of the system which are available to me.	0.76		
14. I fully understand the functions of the system.	0.72		
Outcome Expectancy		0.89	80%
15. The system has made my job less difficult to perform.	0.91		
16. I believe that the system helps me do a better job.	0.88		
System Use			
What percentage of your work time is spent using the system?			

* Attributions were for the causes of unseccessful use of the computer-based system.

To examine the psychometric properties of the measures, a confirmatory factor analysis was performed. This analysis used a structural equations approach in PC SAS version 6.12 (i.e., Calis) and maximum likelihood estimation. Each measure of a latent construct was defined as independent and scaled by setting its standard deviation to one. In addition, each measure and indicant was impacted by a disturbance term that was free to vary. The measures were also allowed to pairwise correlate.

The fit of the model to the data, based on this estimation was described by several statistics. The goodness of fit index was 0.92 and adjusted for degrees of freedom it was 0.87. The root mean square residual was 0.04. The Chi-square statistic was 233.28 with 89 degrees of freedom and was statistically significant at a 1% level. The normed Chi-square statistic was 2.62 while Bentler's comparative fit index was 0.95. The incremental fit indexes ranged from 0.90 to 0.96. These statistics indicate that the fit of the model to the data was good, particularly given the size of the sample (Hair, Anderson, Tatham, & Black, 1992).

Using the standardized path coefficients from these results, the psychometric properties of the measures were evaluated and are shown in Table 2. For ability, the factor loading (i.e., standardized path coefficients) ranged from 0.75 to 0.83. The composite reliability coefficient was 0.83 and the percentage of shared variance was 63%. The effort measure had factor loadings ranging from 0.83 to 0.91 with a reliability coefficient of 0.90. Its shared variance was 75%. The measure of luck had standardized path coefficients of 0.90 and 0.93. Its reliability coefficient was 0.91 and its shared variance was 84%. Task difficulty was composed of four items with path coefficients ranging from 0.75 to 0.92. The reliability coefficient for task difficulty was 0.89 with a shared variance of 68%. Computer self-efficacy had factor loadings of 0.72 and 0.76. Its reliability coefficient was 0.71 with a shared variance of 55%. The final multiple item measure was outcome expectancy. The factor loadings for these items were 0.88 and 0.91 with a reliability coefficient of 0.89. Its shared variance was 80%.

Using these results, the measures can be evaluated. Since all the factor loadings were 0.72 or higher, item reliability is satisfied (Rainer & Harrison, 1993). Because all the reliability coefficients ranged from 0.71 to 0.91, composite reliability is satisfied (Nunnally, 1978). All the average percentages of shared variance were greater than 50%, demonstrating satisfactory levels of this trait (Rivard & Huff, 1988). Due to these desirable values, it can be concluded that convergent validity is satisfied (Rainer & Harrison, 1993; Igbaria & Greenhaus, 1992).

Discriminant validity was also examined. One method to evaluate discriminant validity is to compare, for each pair of measures, the squared correlation to their shared variances. If the shared variances are greater than the squared correlation, discriminant validity for the two measures is satisfied (Fornell & Larcker, 1981). In this case, the squared correlations (shown in Table 3) ranged from 0.01 to 0.50. Thus, discriminant validity was satisfied for all measure pairs. These results, coupled with satisfied convergent validity, imply that the measures satisfied construct validity (Rainer & Harrison, 1993).

Table 3. The Squared Correlations Between the Measures

MEASURE PAIR	SQUARED CORRELATION
Effort-Ability	0.50
Luck-Ability	0.44
Luck-Effort	0.46
Task Difficulty-Ability	0.36
Task Difficulty-Effort	0.20
Task Difficulty-Luck	0.22
Computer Self-Efficacy-Ability	0.28
Computer Self-Efficacy-Effort	0.29
Computer Self-Efficacy-Luck	0.12
Computer Self-Efficacy-Task Difficulty	0.21
Outcome Expectancy-Ability	0.03
Outcome Expectancy-Effort	0.03
Outcome Expectancy-Luck	0.01
Outcome Expectancy-Task Difficulty	0.10
Outcome Expectancy-Computer Self-Efficacy	0.14

THE ESTIMATION OF THE MODEL

In order to test the model and hypotheses described in Figure 1, Callis (PC SAS version 6.12) and maximum likelihood estimation was used. As in the confirmatory factor analysis, all the indicants of the measures were reflective in nature and impacted by a disturbance term free to vary. Similar disturbance terms impacted the endogenous measures in the model. The attributes of ability, effort, luck, and task difficulty were exogenous to the model, and as such, were scaled by setting their standard deviations to one. Setting equal to one the path of one indicant scaled the remaining measures. The ultimate dependent variable was the continuous variable of system use.

THE RESULTS

The statistics summarizing the quality of the fit between the model and the data are shown in Table 4. The goodness of fit index was 0.92 and this statistic adjusted for the degrees of freedom in the model were 0.88. The root mean square residual was 0.04. The Chi-square statistic was 244.00 with 103 degrees of freedom and was statistically significant at a 1% level. The normed Chi-square statistic was 2.37 while Bentler's comparative fit index was 0.96. Bentler and Bonett's normed and non-normed indexes and Bollen's normed and non-normed indexes ranged from 0.90 to 0.96. From these results it can be concluded that this fit is good (Hair, Anderson, Tatham, & Black, 1992).

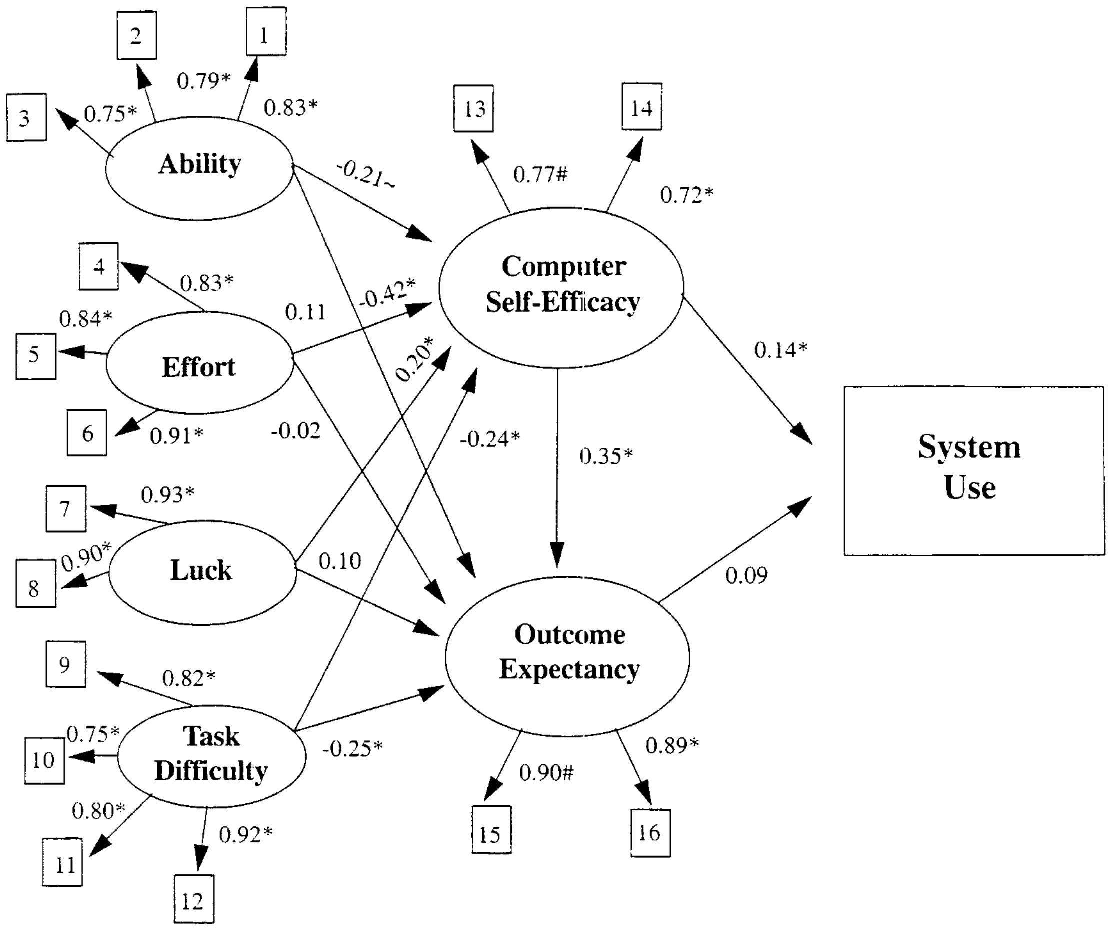
Table 4. The Summary Statistics of the Model's Fit

Statistic	Value
Goodness of Fit Index	0.92
Adjusted Goodness of Fit Index	0.88
Root Mean Square Residual	0.04
Chi-square Statistic	244.00*
Degrees of Freedom	103
Normed Chi-Square Statistic	2.37
Bentler's Comparative Fit Index	0.96
Bentler and Bonett's Non-normed Index	0.94
Bentler and Bonett's Normed Index	0.93
Bollen's Normed Index	0.90
Bollen's Non-normed Index	0.96

*Statistically significant at a 1% level.

The details of these results show that all the indicants with estimated paths were statistically significant at a 1% level. These values were also large enough to be meaningful. All the estimated standard deviations were also statistically significant. The paths between the measures were estimated as well. The path from computer self-efficacy had a significant, positive impact on system use. In addition, computer self-efficacy had a meaningful, positive impact on outcome expectancy. Several of the paths from the attributions to computer self-efficacy and outcome expectancy were also significant. Examining the signs of these significant paths, without considering the direction due to working of the questionnaire items showed that ability, effort and task difficulty had significant, negative influences on computer self-efficacy. Similarly luck had a significant, positive influence on computer self-efficacy. In addition, task difficulty had a significant, negative influence on outcome expectancy. When interpreting the signs of these significant paths, it must be remembered how the items measuring these attributes were phrased. The respondents were asked to remember times when they were unsuccessful in using the computer system. Further, the questions were stated in a negative fashion. For example, the negative coefficients between ability and effort to computer self-efficacy imply that perceptions of low (high) ability or effort correspond to low (high) levels of computer self-efficacy. The negative coefficients between task difficulty to computer self-efficacy and outcome expectancy imply that perceptions of high (low) task difficulty correspond to low (high) levels of computer self-efficacy and outcome expectations. Given the wording of the items forming the luck attribute, the significant, positive relationship between luck and computer self-efficacy implies that attributions to luck for failed system use correspond to high levels of computer self-efficacy. All these results are displayed in Figure 2.

Figure 2. The Empirical Results Using Standardized Path Coefficients



#	Used to scale the corresponding latent variable.
*	Statistically significant at 1%.
~	Statistically significant at 5%.

All estimated standard deviations of the disturbance terms are significant at 1%

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DISCUSSION

The following discussion considers the direction of the wording for the questionnaire items measuring the attributions. It was found that attributions to ability were positively related to computer self-efficacy expectations but not to outcome expectations. Effort was positively related to computer self-efficacy but not outcome expectancies. Luck had a negative influence on computer self-efficacy, but not outcome expectancy. Task difficulty was indirectly related to both computer self-efficacy, but not outcome expectancy. Task difficulty was indirectly related to both computer self-efficacy and outcome expectancy, as hypothesized. In addition, the hypotheses that computer self-efficacy positively influences outcome expectancy and system use were supported.

The major contribution of this study is that it provides general confirmation for the attribution model describing how current and future computer system use may be affected by how an individual attributes unsuccessful use of IT. Its limitations, as with almost all attribution research, is how to accurately measure attributions. This study did not use single item measures as used in past research, but attempted to develop sets of items to measure each construct. Still, the authors employed the most theoretically sound attributes of ability, effort, luck, and task difficulty. A valid argument could be made that other attributions are important. The authors intend to pursue that area by asking, in a field setting, for a compiled list of causes and then classifying causes. This approach has been used before resulting in attributions that can generally be classified into ability, effort, luck, and task difficulty. However, this should not exclude other pertinent causes. It was found that attributions are related to computer self-efficacy, and to a lesser degree outcome expectancy. Further, it was shown that attributions affect system use indirectly through self-efficacy. Thus, the notion that expectancies mediate the relationships between attributions and system use was confirmed.

When unsuccessful performance was attributed to lack of ability, it had a direct effect on computer self-efficacy (i.e., attributions to low ability correspond to low levels of computer self-efficacy) as predicted in hypothesis 1. No supporting evidence was found supporting the similar hypothesis regarding outcome expectancy. These findings provide empirical support for the conceptual distinction made by Bandura (1977) between efficacy and outcome expectations.

Since effort is generally considered an internal and unstable attribution, it is not always expected that failure experiences attributed to effort to negatively affect the end-users' computer self-efficacy (Fosterling, 1985). For a failed IT experience, a lack of effort directly influenced computer self-efficacy (i.e., high levels indicating a lack of effort corresponded to low levels of computer self-efficacy), but not outcome expectancy. One explanation might be that after repeated failure the end-user perceives that any further expenditure of effort may be useless (i.e., they give up, rather than try harder). Past research has shown that, in general, end-users may expend more effort after failure in the belief that outcomes are achievable if they try harder (Wortman & Brehm, 1975). However, this effect was not evident in this study. The primary explanation may be due to the fact that the system had been in place quite some time and did not represent a "new" task. These results provide mixed support for hypothesis 2.

The empirical results also show mixed support for hypothesis 3. Attributions to being "unlucky" for failed IT use had a positive impact on computer self-efficacy (i.e.. a high score on attributing unsuccessful IT use to being unlucky correspond to high levels of computer self-efficacy), but not on outcome expectancy. One potential explanation for the meaningful relationship is that for individuals possessing high levels of self-efficacy, when they experience a failure using IT, the failure is attributed to being "unlucky" as opposed to any personal shortcoming.

The relationship between task difficulty and expectations has been documented in past research (Atkinson & Feather, 1966; Parsons & Ruble, 1972). However, the research on attributions has generally confounded the effects of attributions on efficacy and outcome expectations by using ambiguous questions that fail to differentiate between the two types of expectancies (Eastman & Marzillier, 1984; Gist & Mitchell, 1992). These results confirm that for failed IT experiences, attributions to difficulty of the tasks performed have negative impacts on computer self-efficacy and outcome expectancy. Moreover, the finding can be explained in that task difficulties with using the system are usually classified as stable and external attributions. Theoretically, task difficulty attributions would not imply personal inadequacy and would therefore not be expected to adversely effect computer self-efficacy expectations. However, in the current study it appears that the practical intuitive hypotheses (i.e., hypotheses 4A and 4B) were supported.

APPLICATIONS

These results demonstrate the relationships between specific attributions, computer self-efficacy, outcome expectancy and system use. Coupled with other research on the acceptance and rejection of IT as well as attributional research testing the effects of strategies for behavioral change (Gist et al., 1989), several suggestions can be made regarding system use. First, it appears that system designers can enhance the acceptance of IT by making sure that users experiencing difficulties receive feedback resulting in attributions facilitating interactions with the system. Feedback teaching users to attribute poor performance to unstable and external characteristics is helpful in that self-efficacy is not eroded. This may be more effective with new systems versus systems that have been in place for a longer time-frame. In addition, based on these results, it would seem that a good strategy is to design feedback suggesting that users are capable (i.e., have the ability) and with more effort, they can master the system, even if it is difficult. Role models who are perceived to have abilities similar to the users who are experiencing difficulties may be particularly helpful in communicating that users can succeed if they expend reasonable effort.

Finally, immunizing users to the effects of negative attributions by designing introductory experiences with the system designed to facilitate optimistic attributions is an important aspect of system design. It can increase the probability of system use, especially where IT is volitional. While these introductory experiences should primarily result in success, the users can also learn to process failures by interacting with the system since the ability to respond positively to failure is as important as how individuals respond to success (Clifford, 1978). Thus, the introductory aspects of system design should strongly emphasize that end-users are efficacious and capable. Further, unsuccessful experiences are generally due to a lack of effort, successful experiences are due to both ability and effort, and that the benefits of using the system with respect to work performance are considerable. Such features should result in both positive efficacy and outcome expectations that lead to optimal use of the IT.

CONCLUSIONS

The principle contribution of this study is that it confirms several of the major relationships depicted by attributional models describing the process by which individuals attribute their unsuccessful computer system use to specific causes. It demonstrates that , at least within this context, attributions shape primarily self-efficacy expectations and ultimately system use. These findings are important, not only within the context of explaining system use, but also within the more general context of attribution and motivation theory. Although there are a number of limitations regarding the current research, the results suggest that attributional explanations appear both valid and useful components for explaining system use. In addition, other relations suggested by the model include the realization that relationships between attributions and computer system use may be different for different systems and time-frames. These implications may also be beneficial to consider.

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